

McIntosh

MX 112

FM/AM TUNER PREAMP



SERVICE INFORMATION

STARTING WITH SERIAL NO. 40500

McINTOSH LABORATORY INC. 2 CHAMBERS STREET BINGHAMTON, NEW YORK

MX 112

ELECTRICAL SPECIFICATIONS

FM TUNER SECTION

USABLE SENSITIVITY

Better than $2.5\mu\text{F}$ (IHF usable sensitivity)

SIGNAL TO NOISE RATIO

Better than 65dB

HARMONIC DISTORTION

Mono, less than 0.5%. Stereo, less than 0.8%.

FREQUENCY RESPONSE

Flat from 20Hz to 20kHz with standard de-emphasis and 19kHz pilot filter

CAPTURE RATIO

Better than 1.5dB

SPURIOUS REJECTION

90dB or greater

IMAGE REJECTION

75dB or greater (at 100MHz)

STEREO SEPARATION

Better than 30dB at 1kHz

AM TUNER SECTION

SENSITIVITY

Better than $12\mu\text{V}$ at 1000kHz (using external antenna input)

SIGNAL TO NOISE RATIO

Better than 55dB

HARMONIC DISTORTION

Less than 1% at 30% modulation

FREQUENCY RESPONSE

Down 6dB at 5kHz

SELECTIVITY

10kHz at -6dB

IMAGE REJECTION

60dB or greater at 1000kHz

PREAMPLIFIER SECTION

FREQUENCY RESPONSE

 $\pm 0.5\text{dB}$, 20Hz to 20,000Hz

DISTORTION

Less than 0.1% at 2.5 volts 20Hz to 20kHz

INPUT SENSITIVITY (phono 1 and phono 2)

2 millivolts for 2.5 volts output at 1kHz

INPUT SENSITIVITY (aux, tape)

0.25 volts for 2.5 volts output

HUM AND NOISE (phono 1 and phono 2)

72dB below 10 millivolt input

HUM AND NOISE (aux, tape)

85dB below rated output

OUTPUT (main)

2.5 volts with rated input. Up to 10 volts can be developed without distortion. FM and AM will produce up to 10 volts output at 100% modulation.

OUTPUT (tape)

0.25 volts with rated input. Phono input signal of 10 millivolts produces 1.2 volts output. FM and AM will produce 1 volt output at 100% modulation.

OUTPUT (center channel)

2 volts with rated input to both channels

BASS CONTROL

-18dB to +16dB at 20Hz

TREBLE CONTROL

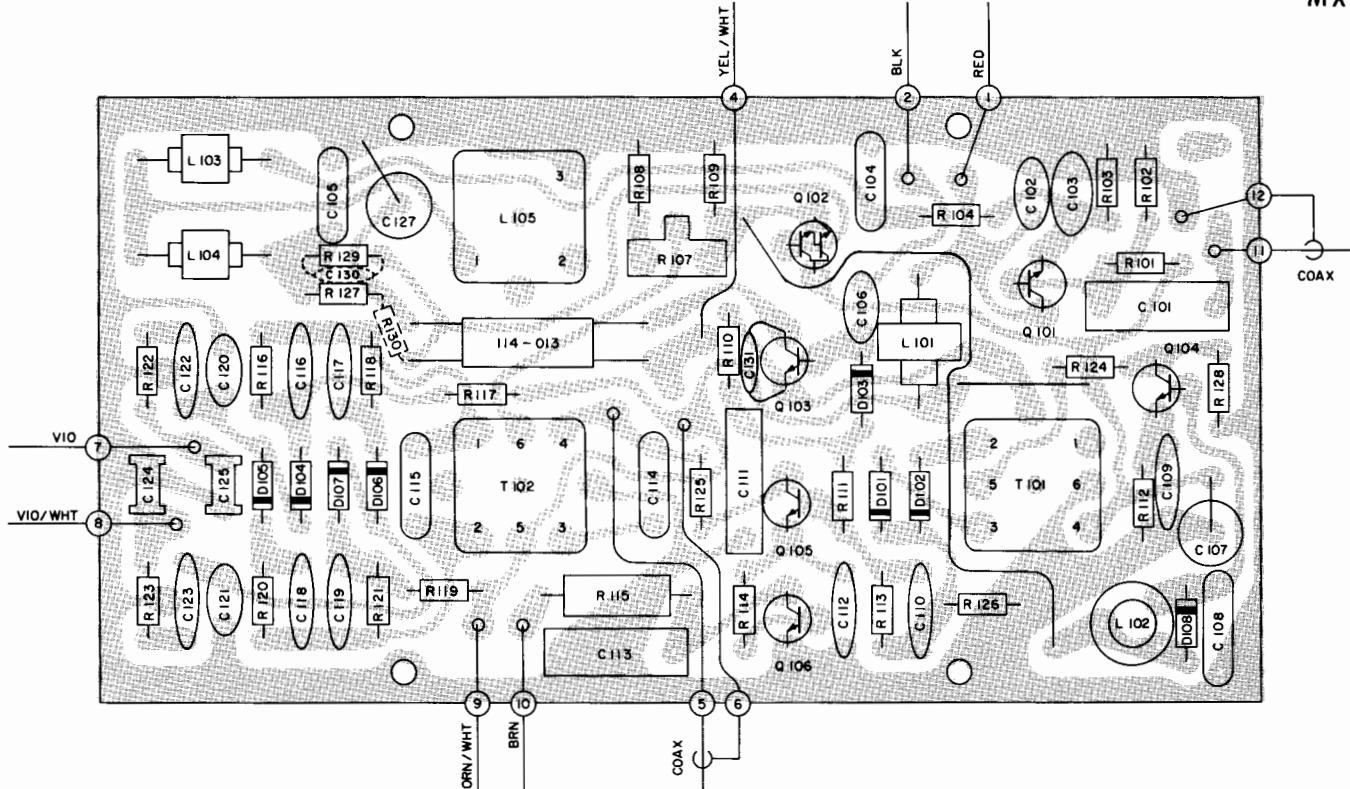
 $\pm 20\text{dB}$ to 20,000Hz

LF FILTER

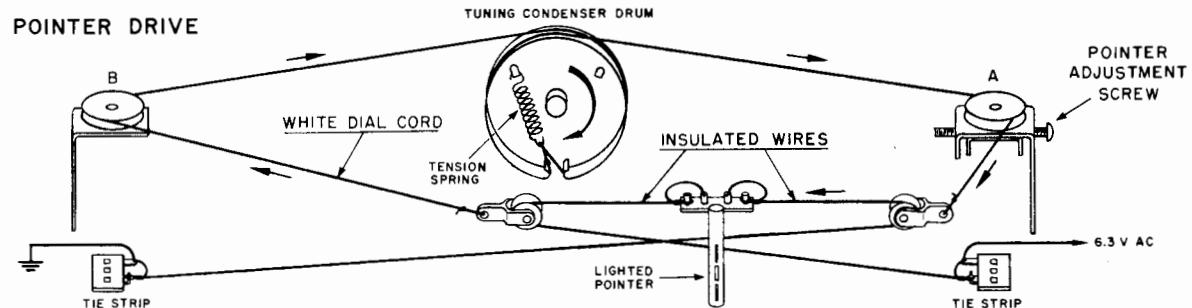
Flat or roll off below 50Hz, down 12dB at 20Hz

HF FILTER

Flat or roll off above 5000Hz, down 12dB at 20,000Hz



MPX PRINTED CIRCUIT BOARD 043-974

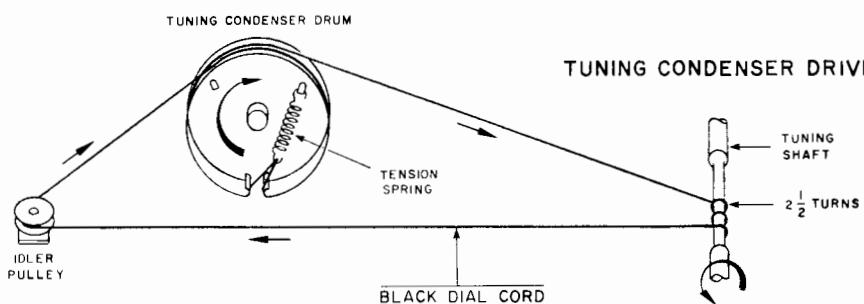


Step 1 Before stringing unit, turn pointer adjustment screw until pulley "A" is in the center of its travel.

Step 2 String unit as shown.

Step 3 After stringing unit, turn tuning shaft until pointer is as far to the left as it will go. Turn the pointer adjustment screw until the pointer coincides with the zero bar of the logging scale.

Step 4 Turn the tuning knob making the pointer move back and forth from one end of the dial scale to the other. Return pointer to the far left and, if necessary, re-adjust pointer position.

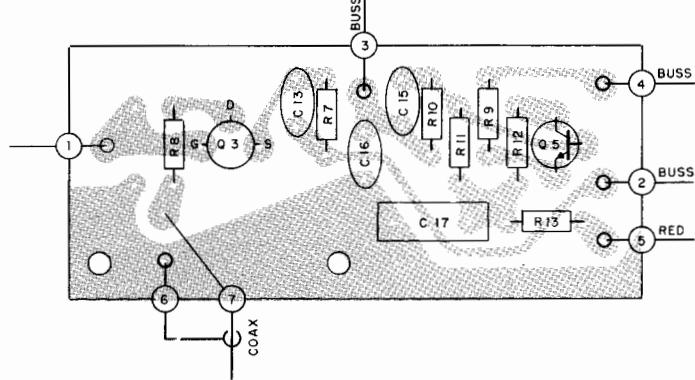


DIAL CORD SEQUENCE

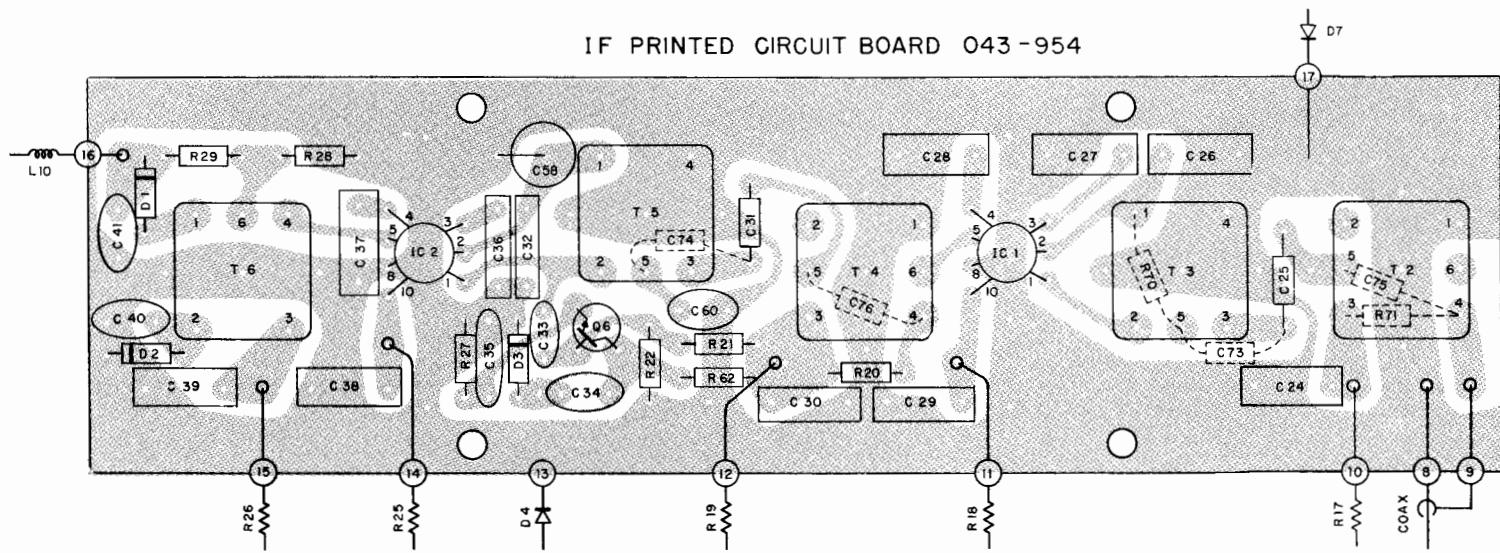
(TO LEFT SIDE PULLEY B) WHITE
 (TO IDLER PULLEY AND TUNING SHAFT) BLACK
 (TUNING CONDENSER DRUM (TOP VIEW))
 WHITE (TO RIGHT SIDE PULLEY A)
 BLACK (TO TUNING SHAFT)

POINTER DIAL STRINGING

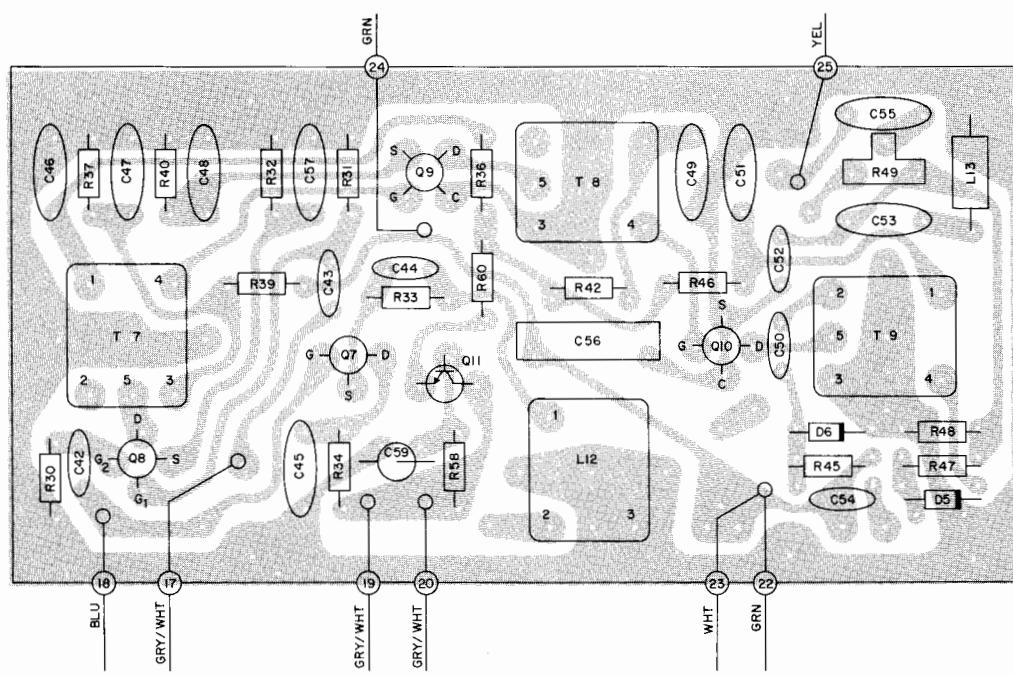
MIXER AND LOCAL OSCILLATOR P.C. BOARD
043-953



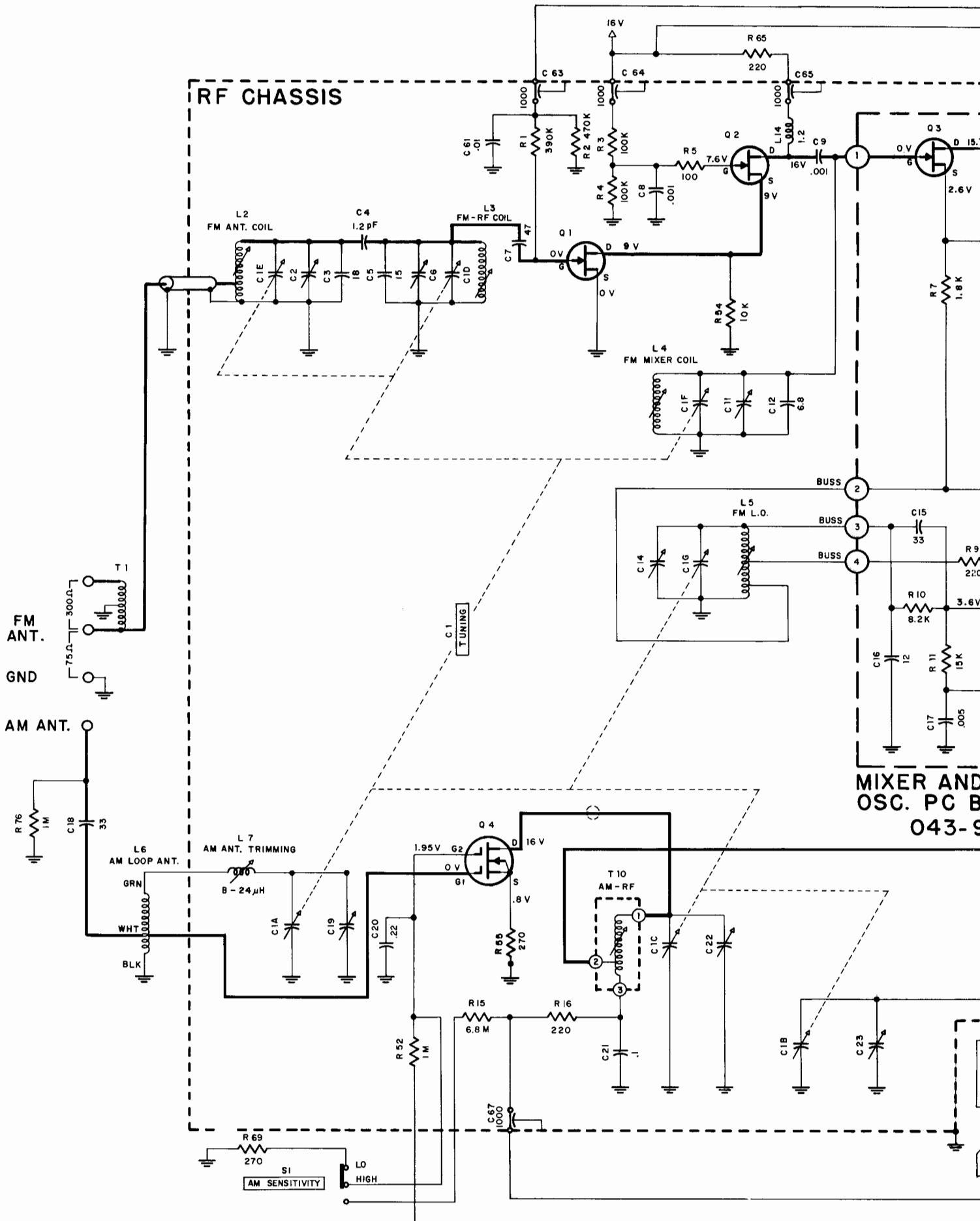
IF PRINTED CIRCUIT BOARD 043-954

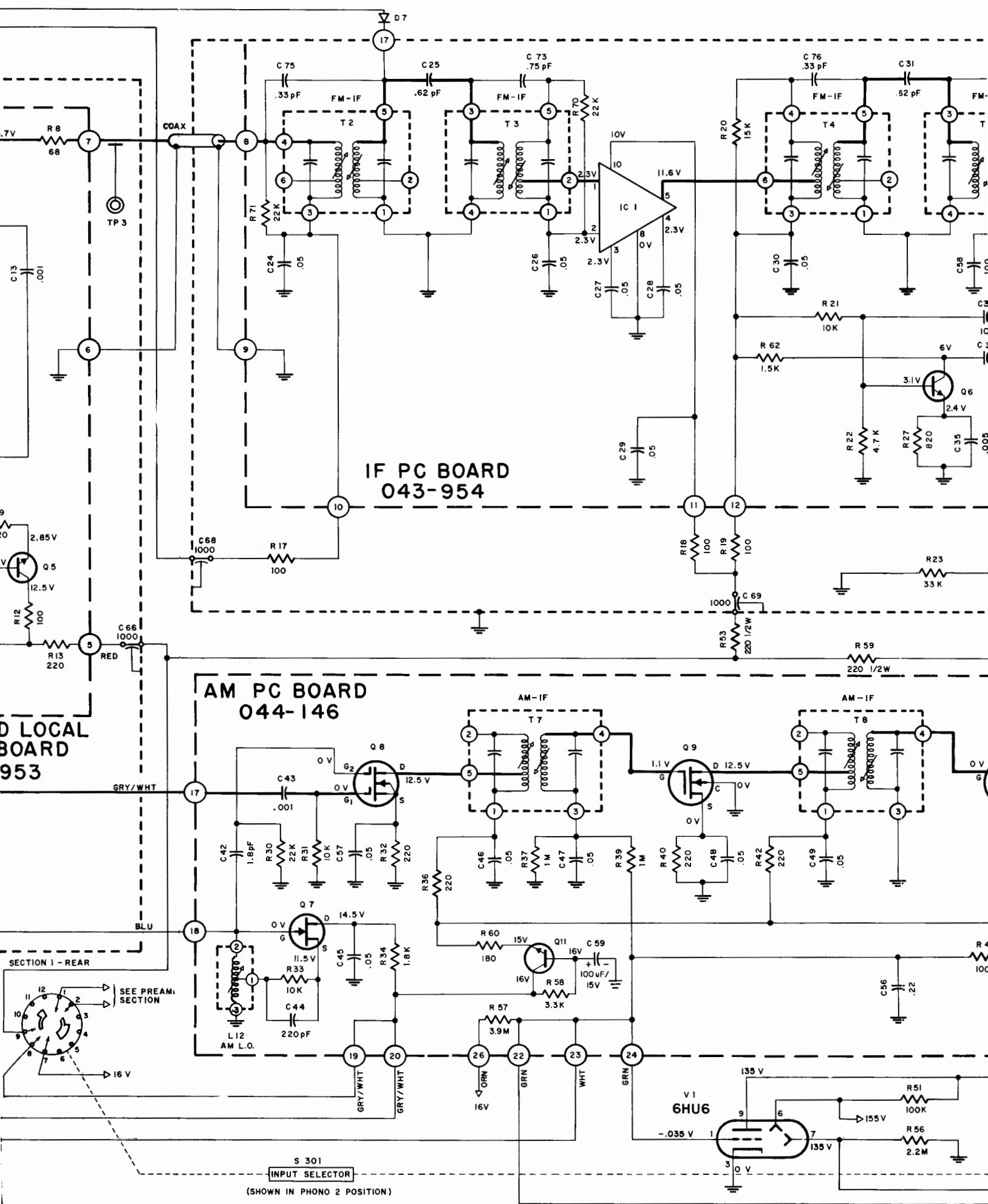


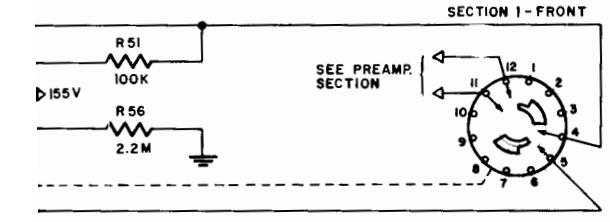
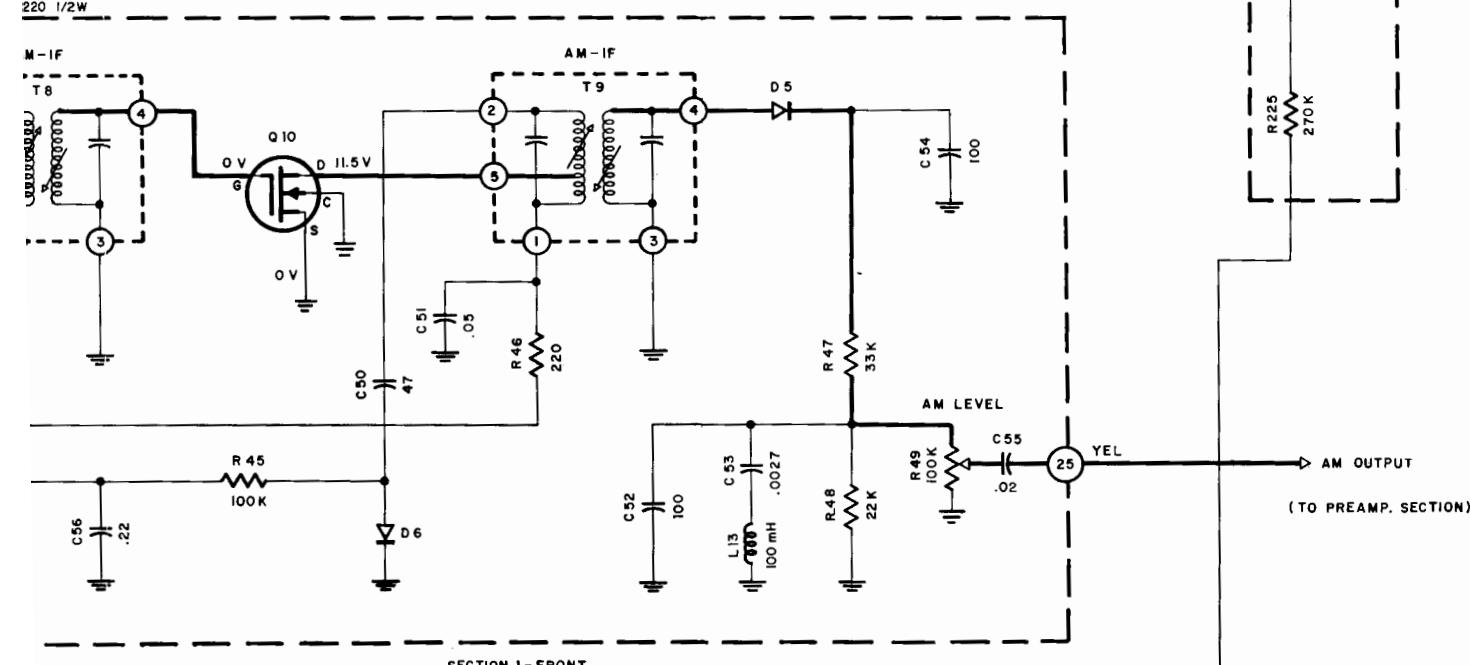
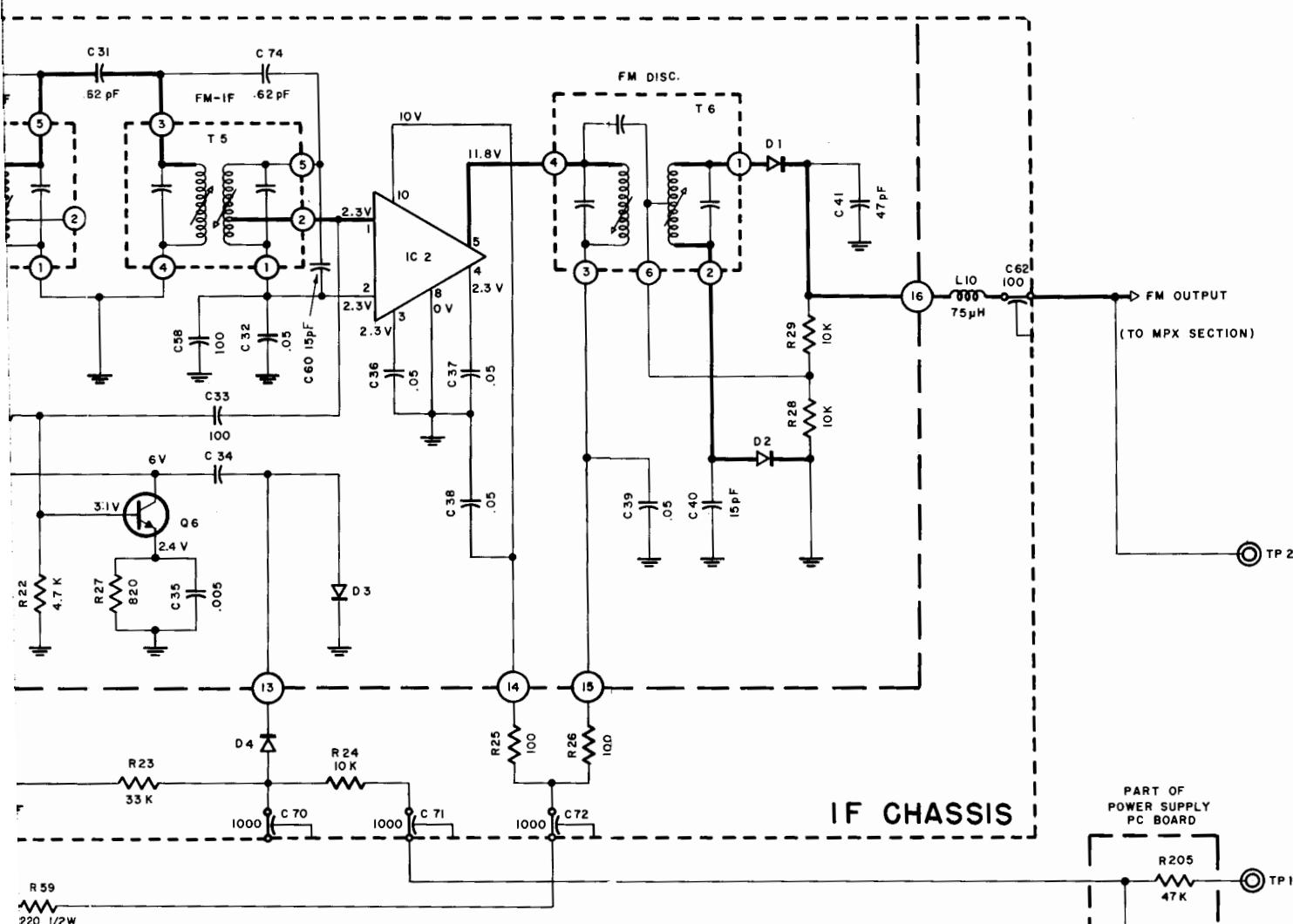
AM PRINTED CIRCUIT BOARD 044-146



RF CHASSIS







FM/AM TUNER SECTION

SCHEMATIC NOTES

Unless otherwise specified: Resistance values are in ohms, 1/4 watt, and 10% tolerance; capacitance values smaller than 1 are in microfarads (μF); capacitance values greater than 1 are in picofarads (μF); inductors are in microhenries (μH).

Printed circuit board components are outlined on the schematics by dotted lines. The circled numbers around the dotted lines correspond to the numbers on the PC Board layouts.

The heavy lines on the schematics denote the primary signal path.

The terminal numbering of rotary switches is for reference only.

All voltages indicated on the schematics are measured under the following conditions:

- Use of an 11 megohm input impedance VTVM.
- All voltages $\pm 10\%$ with respect to chassis ground.
- No signal at input or antenna terminals.
- AC input at 117 volts, 50/60Hz.
- Front panel controls at:

Tuning indicator 100MHz (no signal)

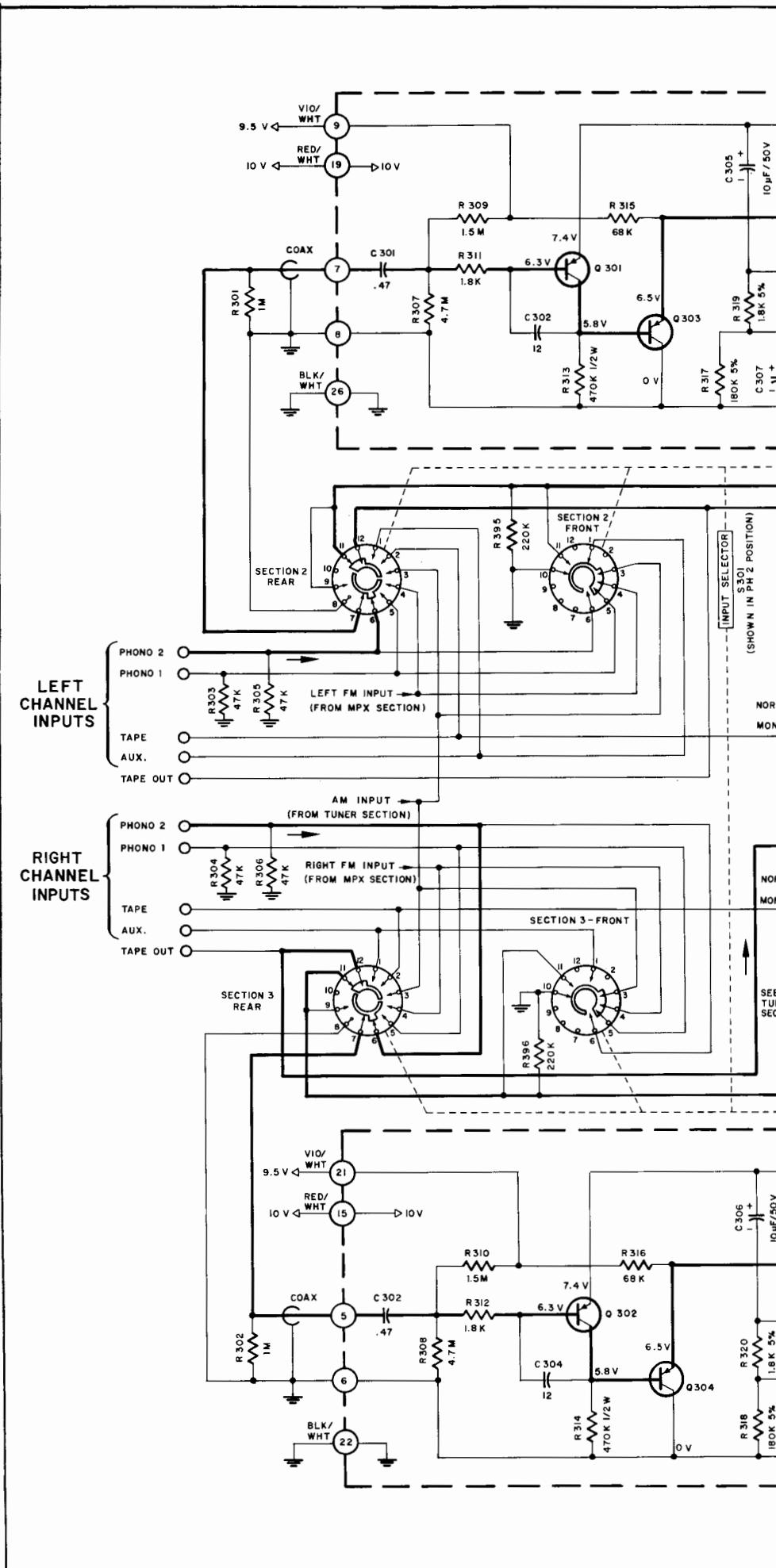
Volume Fully CCW

Mode Stereo

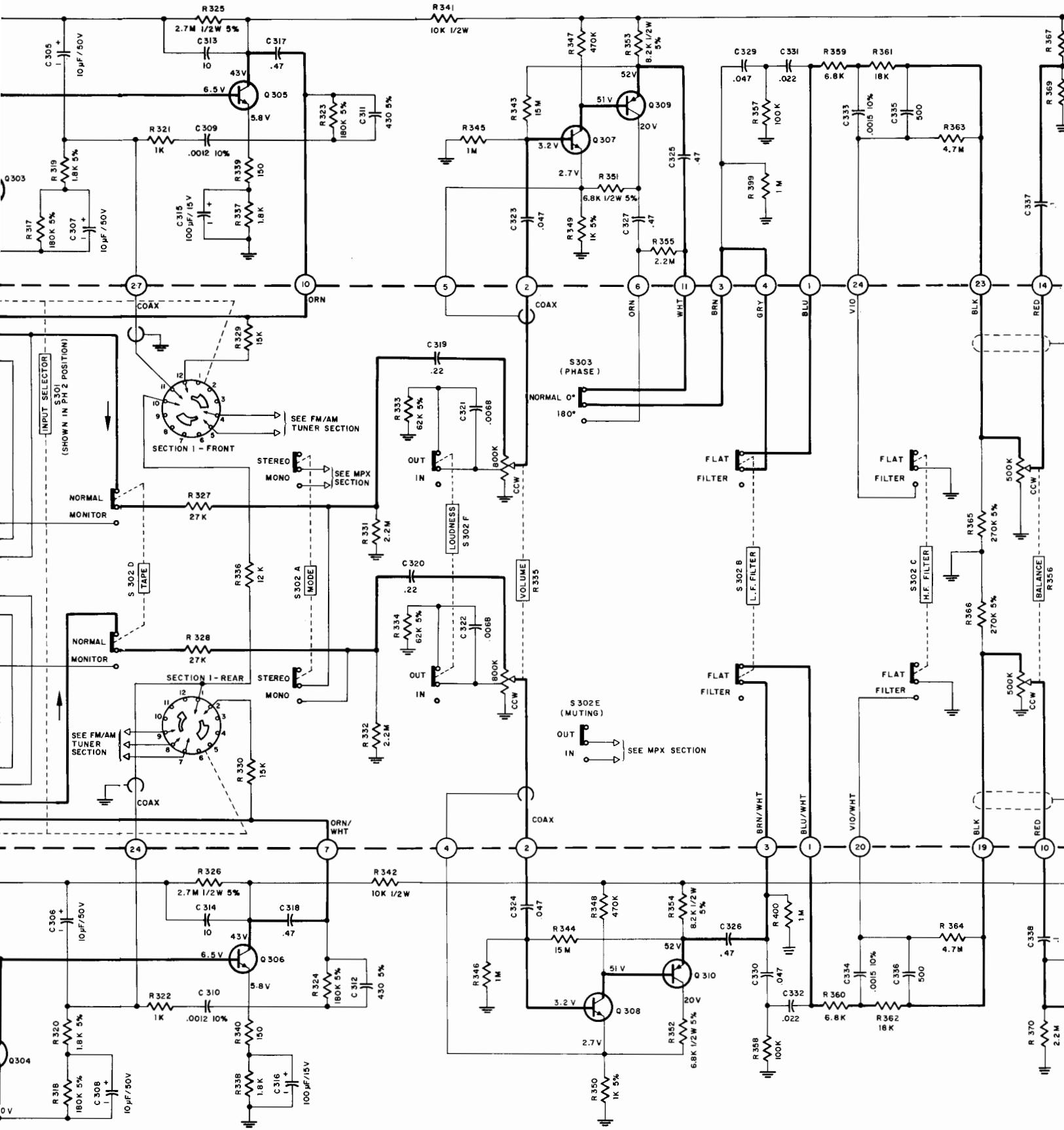
Muting Out

Input Selector AM (to measure AM section)
FM (to measure FM section)

Panel Lights Bright

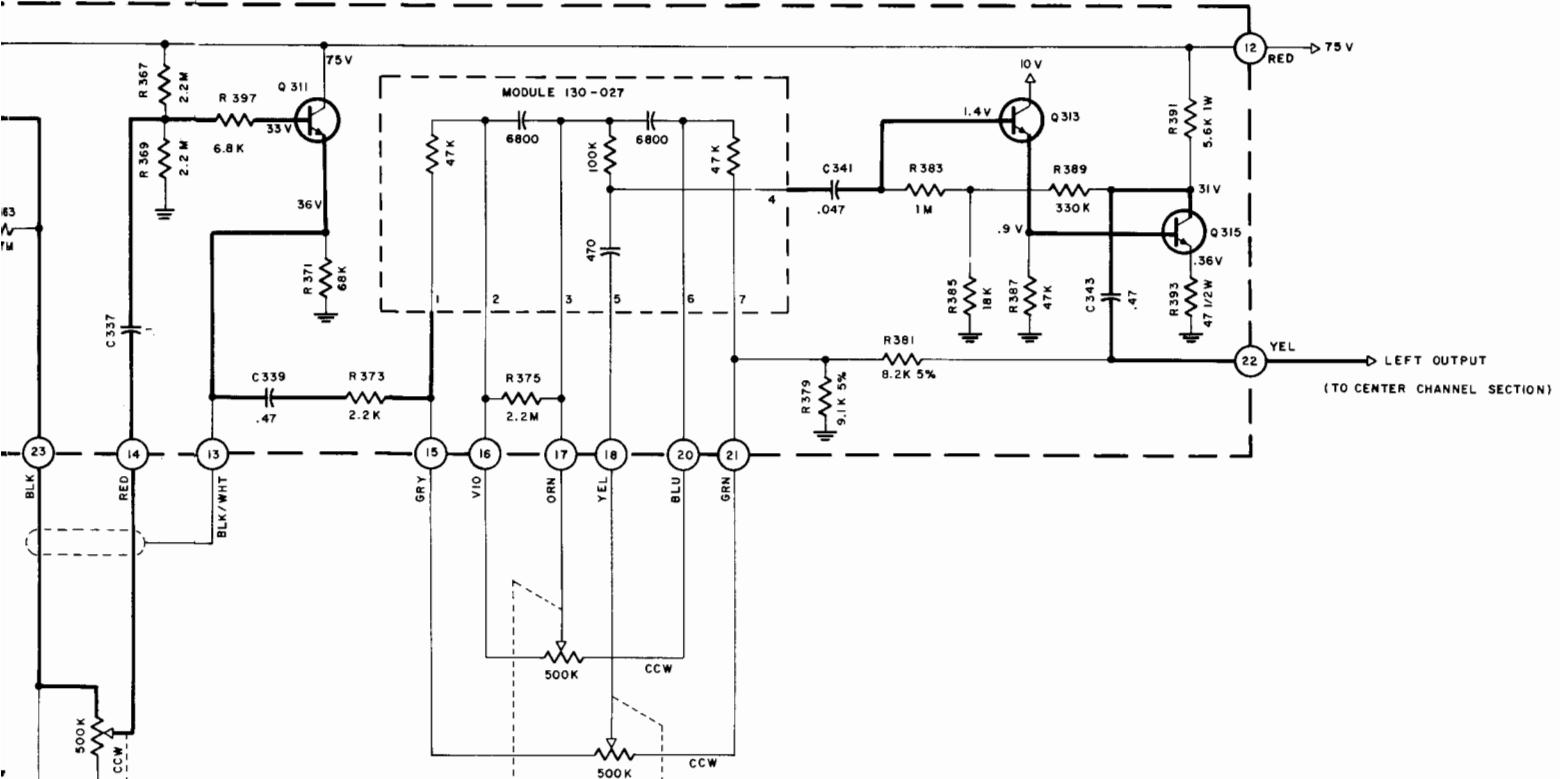


LEFT CHANNEL PREAMP. PRINTED CIRCUIT BOARD



RIGHT CHANNEL PREAMP. PRINTED CIRCUIT BOARD

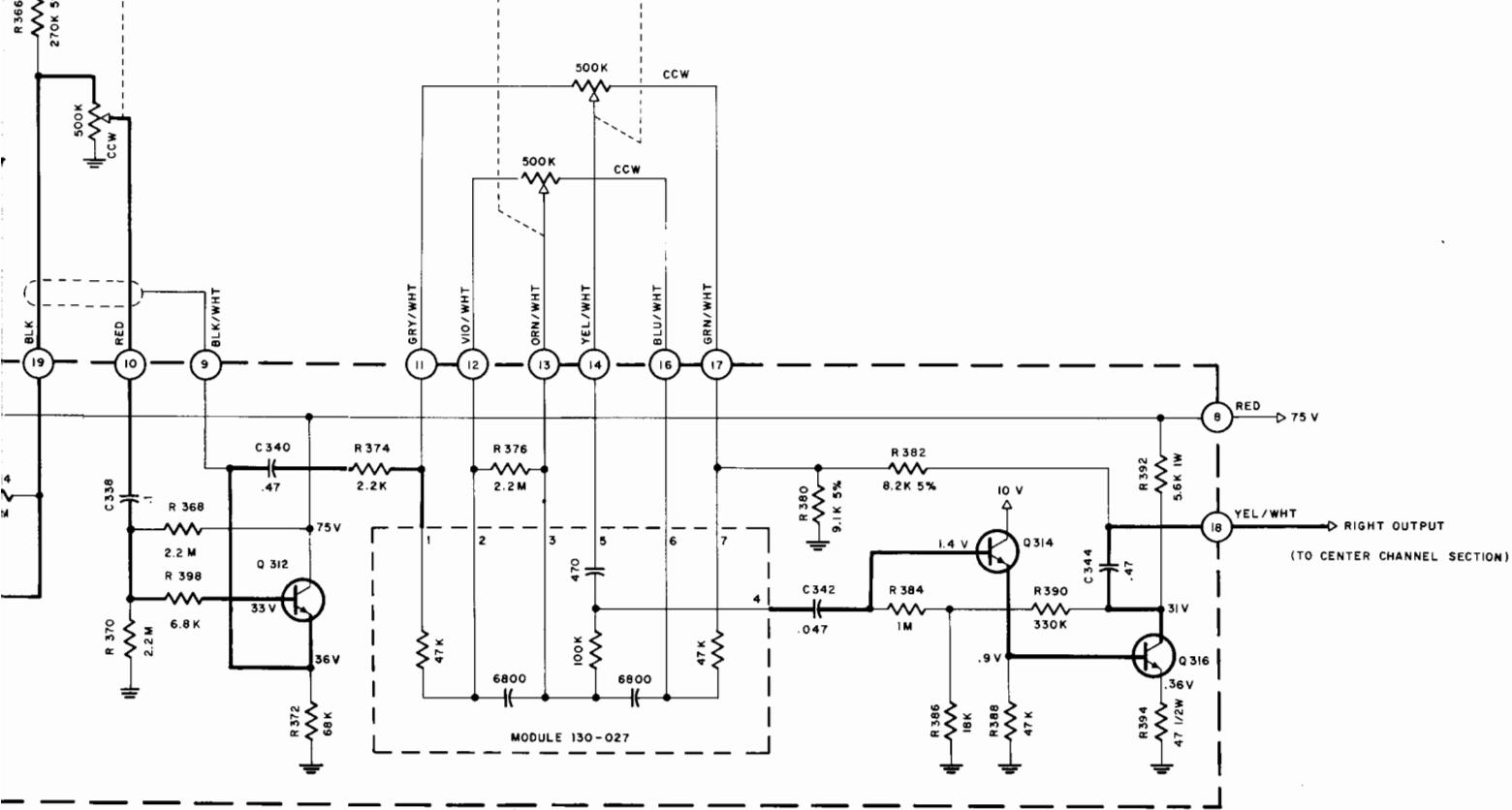
CIRCUIT BOARD 043-991



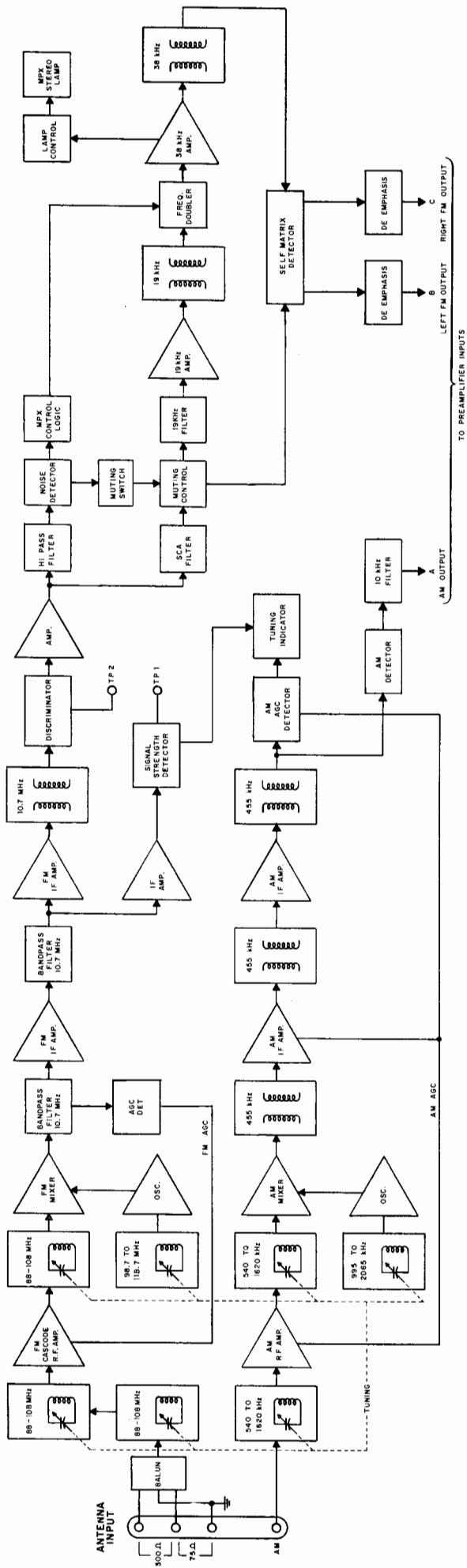
PREAMP. SECTION

MX 112

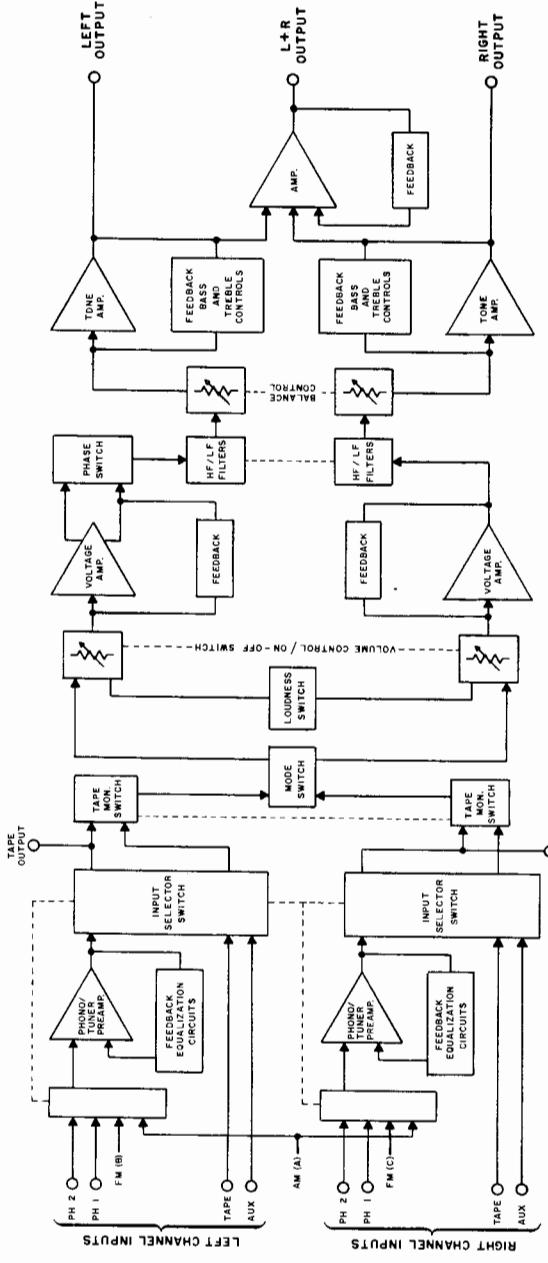
154 - 444



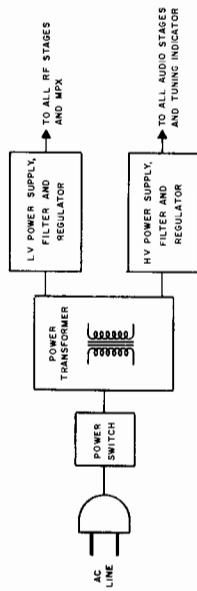
FM/AM TUNER SECTION



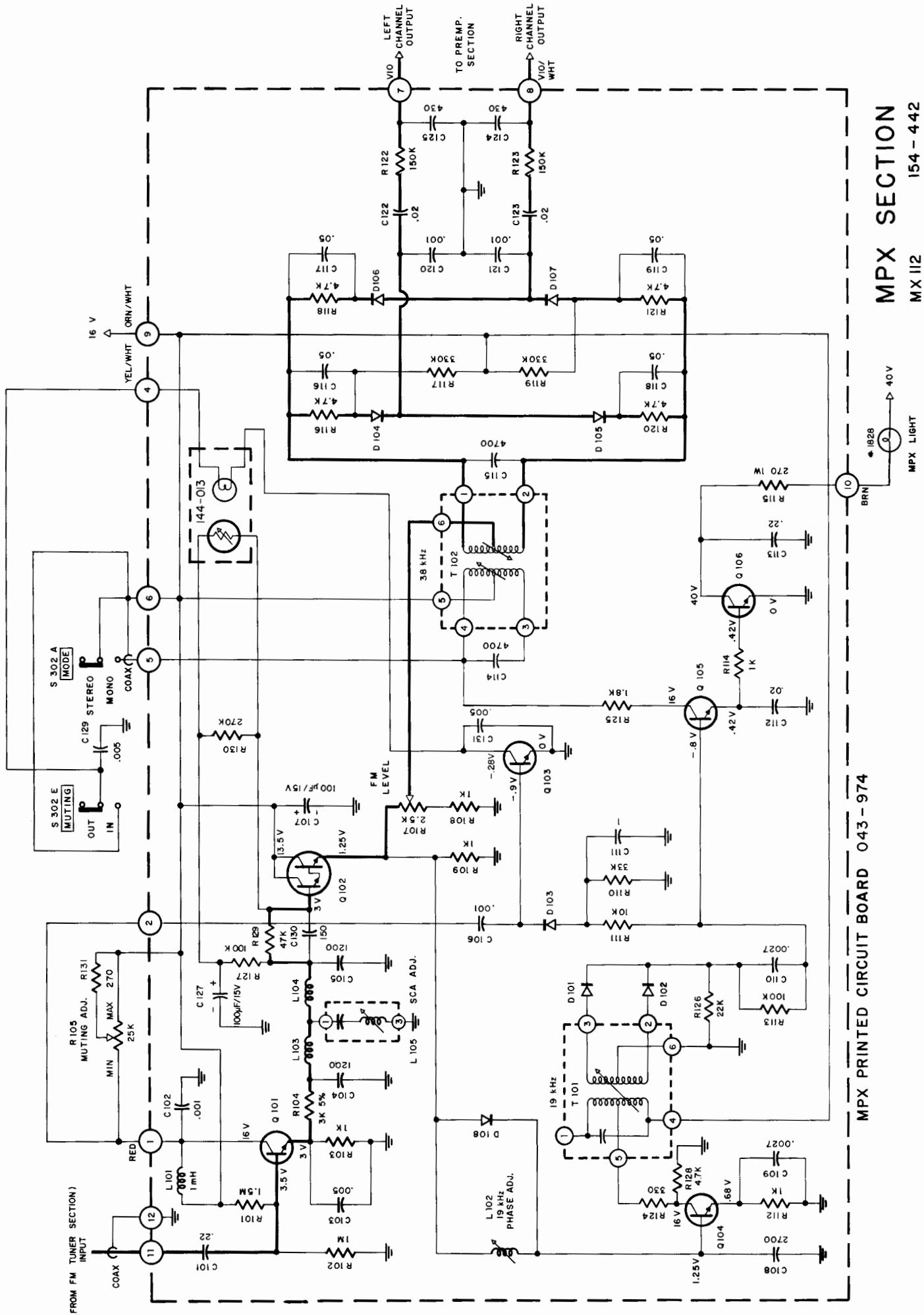
PREAMPLIFIER SECTION

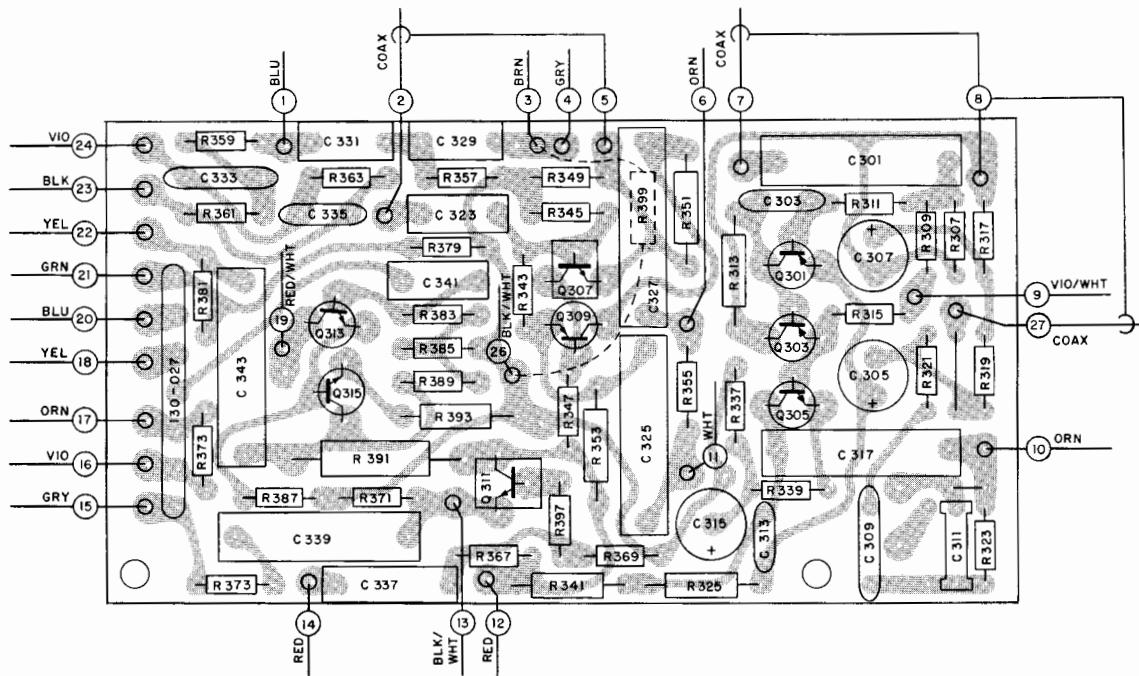


POWER SUPPLY

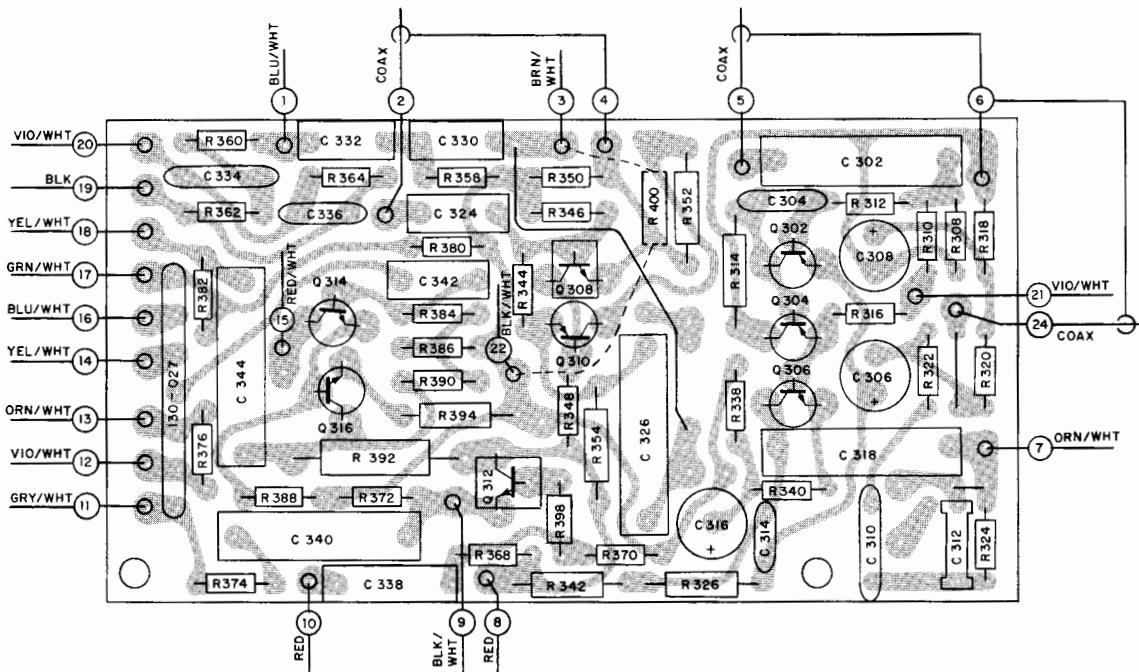


MX 112 BLOCK DIAGRAM

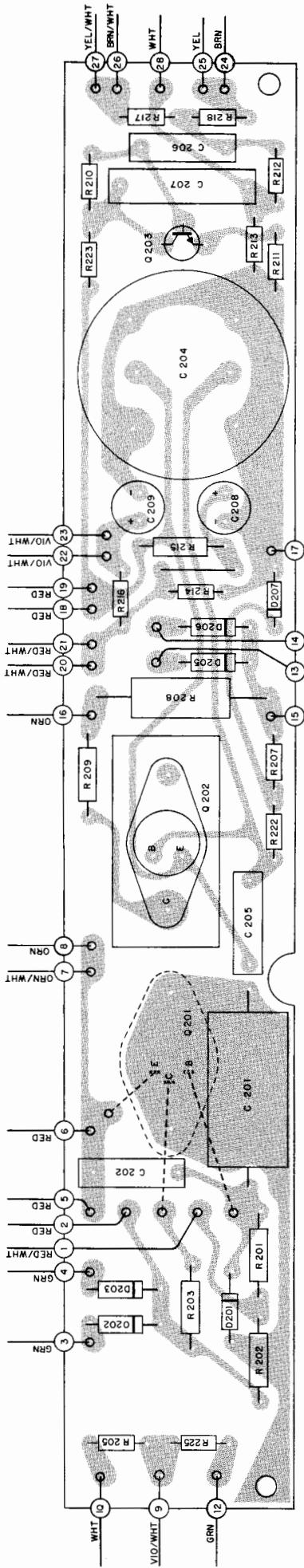




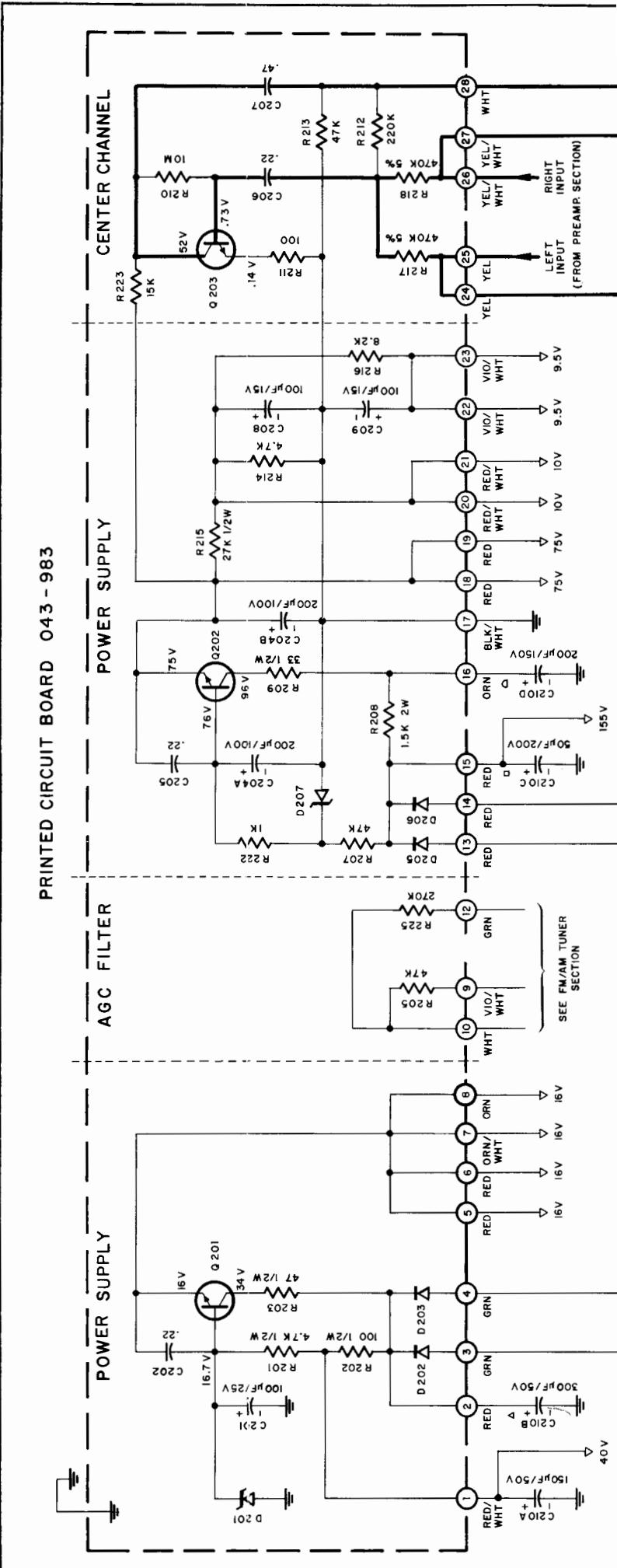
LEFT CHANNEL PREAMP PRINTED CIRCUIT BOARD 043-991



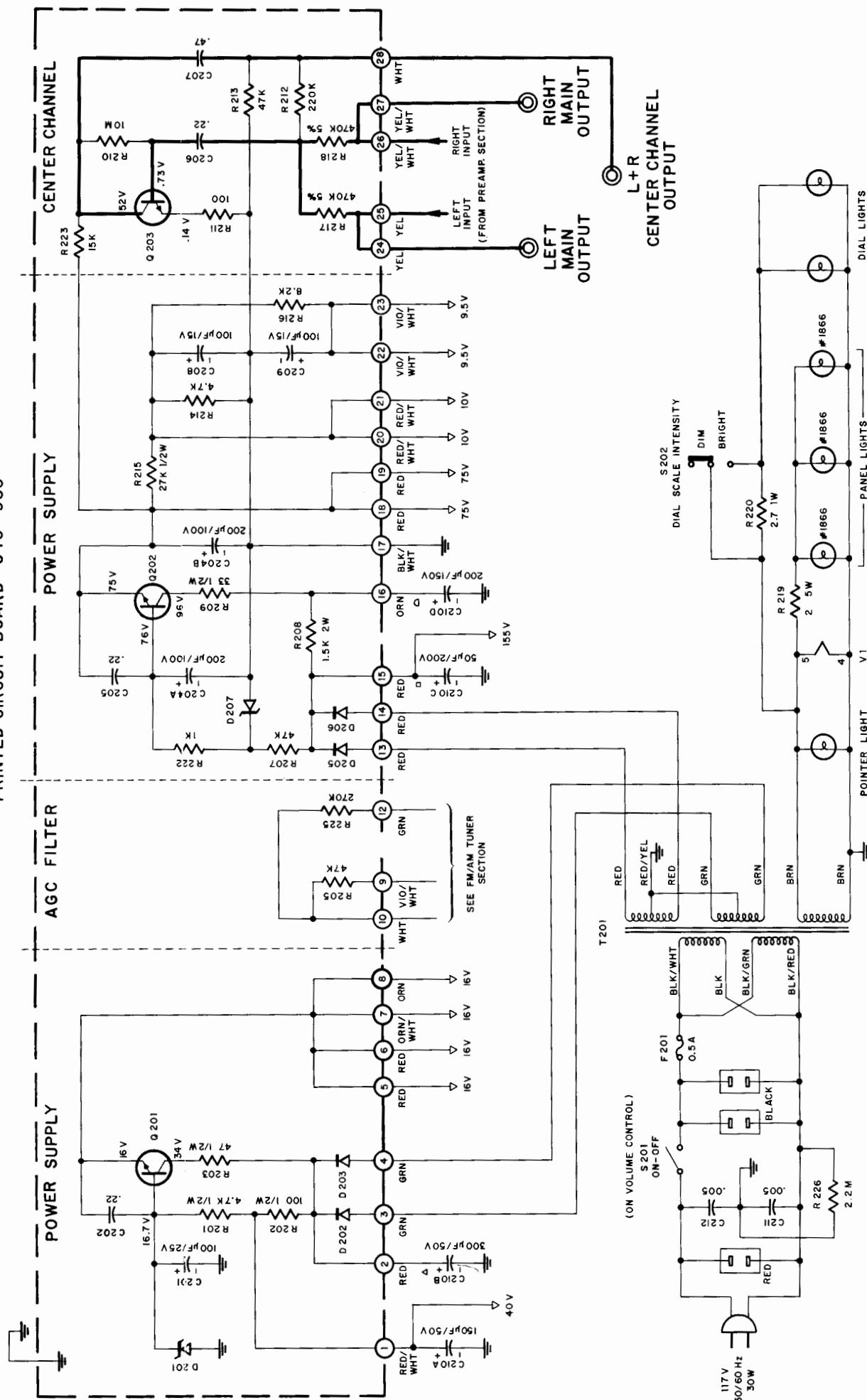
RIGHT CHANNEL PREAMP. PRINTED CIRCUIT BOARD 043-992



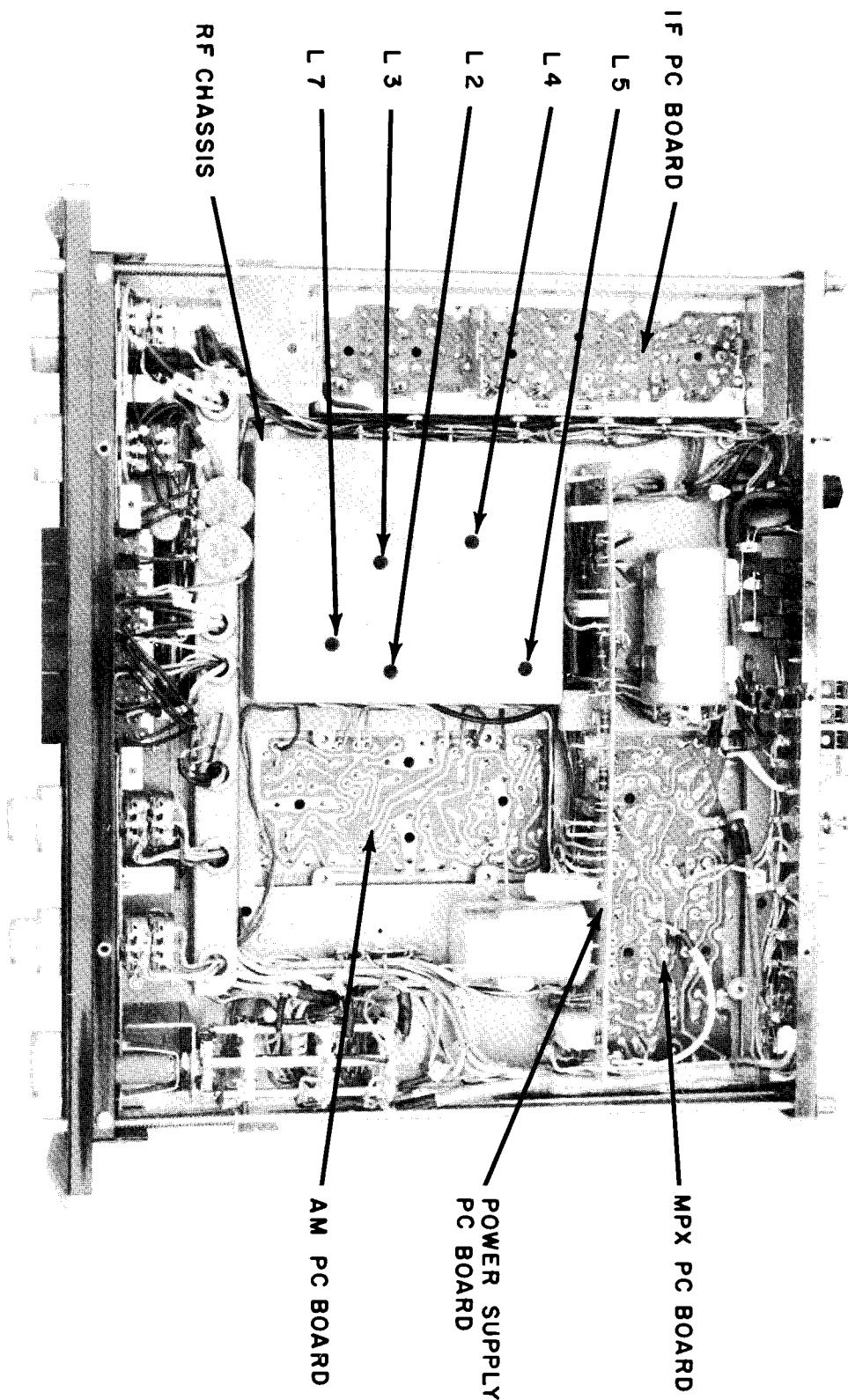
PRINTED CIRCUIT BOARD 043-983

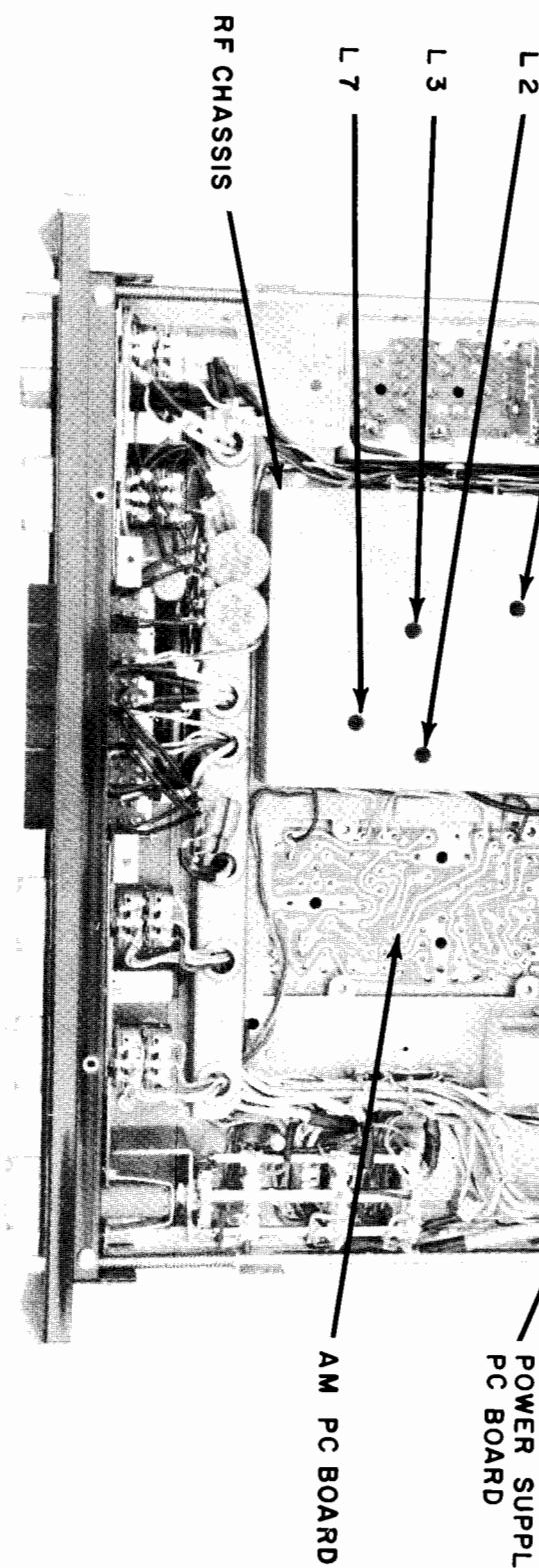
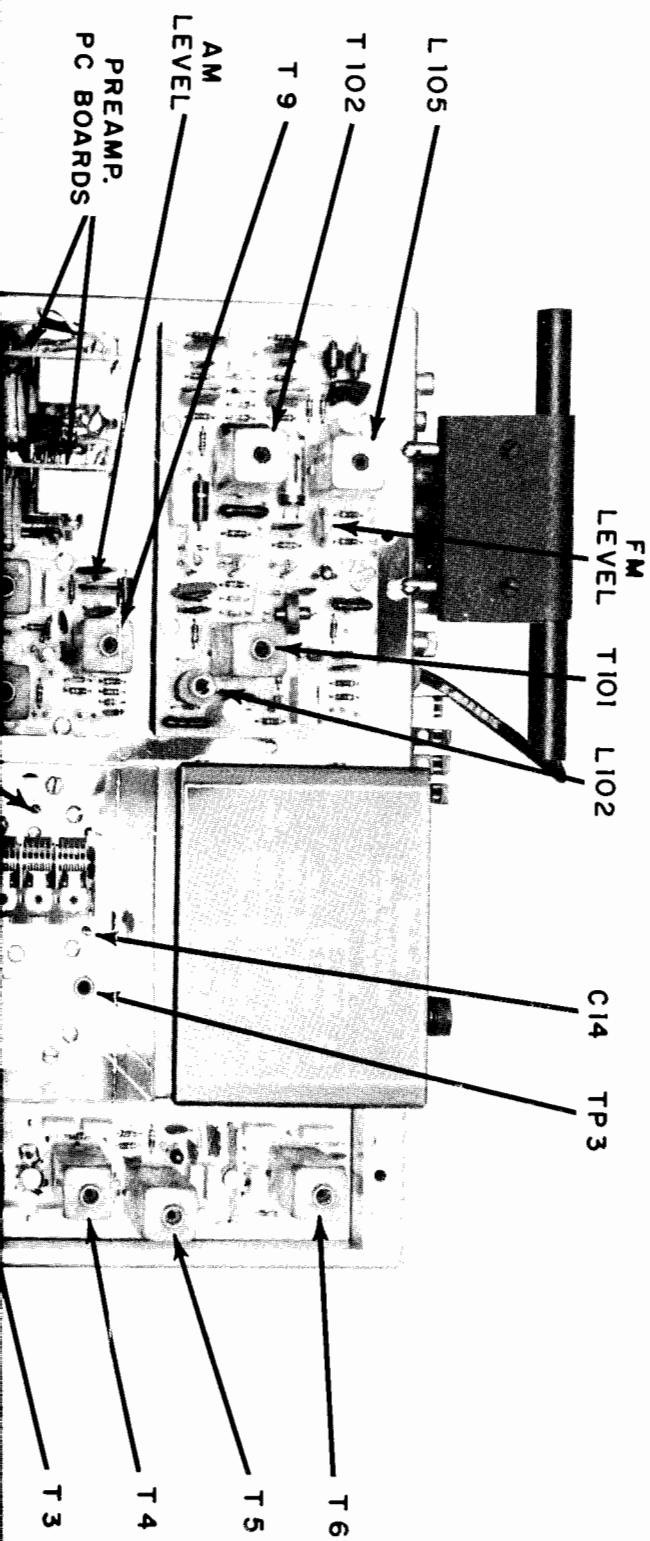


PRINTED CIRCUIT BOARD 043-983

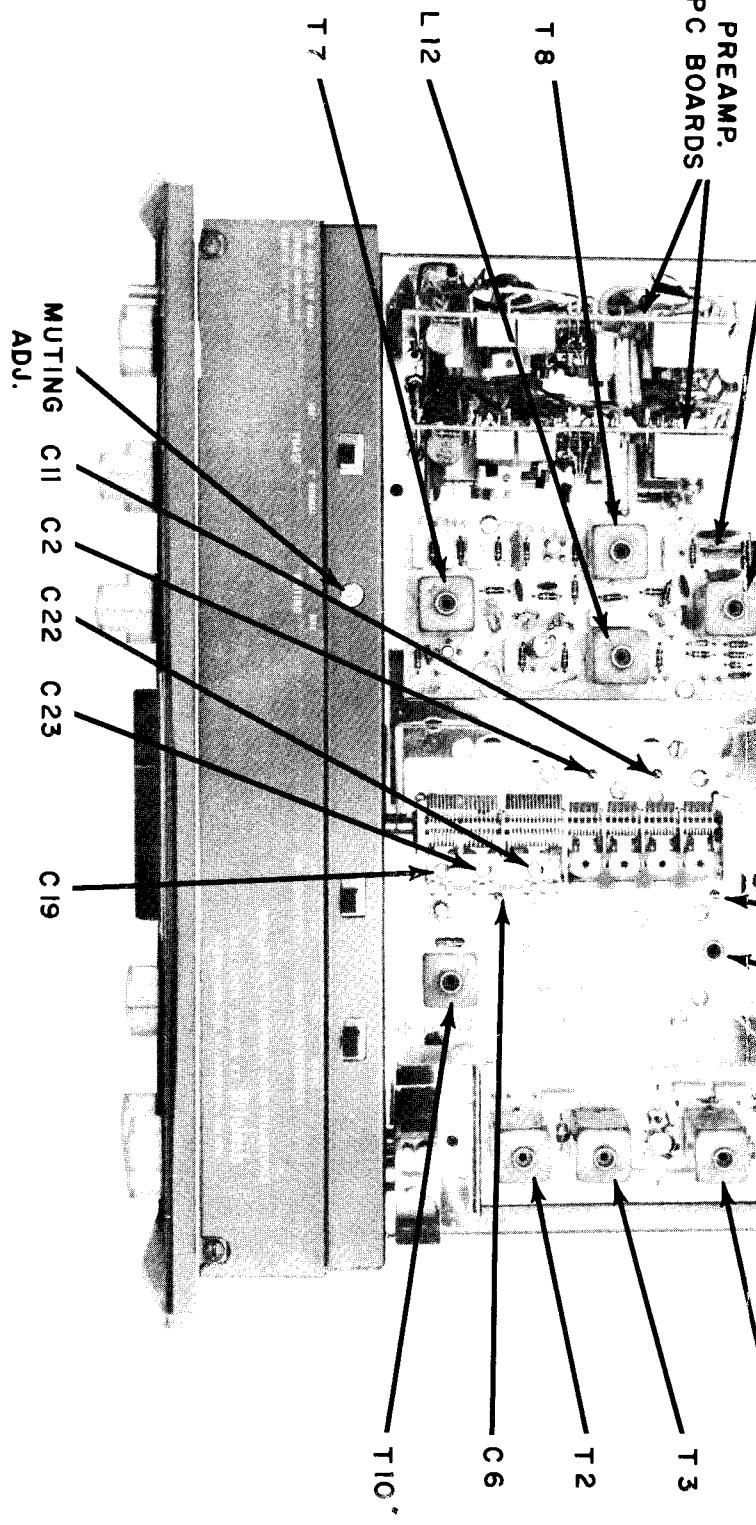


POWER SUPPLY / CENTER CHANNEL SECTION





PREAMP. PC BOARDS



MX 112 ALIGNMENT INSTRUCTIONS

All McIntosh tuners are carefully aligned and tested at the factory using the finest available test equipment. All McIntosh tuners will meet their published specifications when shipped from the factory.

After extensive operation, or servicing, it may be desirable to realign the tuner circuits for best performance. The charts below give complete information on the circuit realignment procedure for the MX 112.

The test equipment listed (or its equivalent) is necessary to properly align an MX 112. The accuracy of the alignment will be directly related to the accuracy and calibration of the test equipment used.

If the necessary test equipment is not available, alignment should not be attempted. For additional information, contact Customer Service Department, McIntosh Laboratory Inc., 2 Chambers Street, Binghamton, New York 13903 (telephone 607-723-3512).

Alignment should be done in the following order: AM-FM-MPX

TEST EQUIPMENT REQUIRED

1. FM Signal Generator (Measurements 188 or equivalent)
2. AM Signal Generator (Measurements 65B or equivalent)
3. VTVM
4. Multiplex Generator (RCA WR-51A or equivalent)
5. 10.7MHz Generator (preferably crystal controlled)
6. Oscilloscope (Hewlett-Packard 120B or equivalent)
7. Harmonic Distortion Analyzer (Hewlett-Packard 333A or equivalent)

AM ALIGNMENT

STEP	TUNER DIAL SETTING	SIGNAL GENERATOR			INDICATOR	ADJUST	TEST LIMITS	REMARKS
		FREQ.	COUPLING	MODULATION				
1	Point of no interference or signal	455kHz	Through external .01 μ F capacitor to junction of C143 and T10 pin 2.	CW	VVTM	Junction of C55 and C56 and sliding arm of AM level pot.	Top (pri) & bottom (sec) cores of T7, T8 and T9	Switch input selector to FM to make AM local oscillator inoperative. As the tuner output increases, attenuate generator output to keep tuner output at minimum.
2	600kHz	600kHz	Through a 200PF capacitor to ant. terminals.	Same	Same	L12 (oscillator coil)	Maximum possible voltage	Same as step 1 except input selector is on AM.
3	1400kHz	1400kHz	Same	Same	Same	C23 (oscillator trimmer)	Same	Repeat steps 2 & 3 until dial calibration is accurate.
4	600kHz	600kHz	Same	Same	Same	L17 (AM antenna trimming coil) & T10 (AM-RF)	Same	Same as step 1 except input selector is on AM.
5	1400kHz	1400kHz	Same	Same	Same	C19 (AM antenna trimmer) & C22 (AM RF trimmer)	Same	Repeat steps 4 & 5 until output is as high as possible.
6	1000kHz	1000kHz	Same	30% @ 400Hz	Distortion Analyzer	L or R output	With a distortion analyzer, the following measurements can be performed:	
							1. IHFM sensitivity of 10 microvolts for -20dB of signal to noise ratio. (this measurement is only possible in the absence of man-made interference, as fluorescent lamps, etc.)	
							2. With a 1mV input signal, harmonic distortion, whistle filter attenuation at 10kHz modulating frequency and signal to noise ratio may be measured.	
							3. With a 1mV input signal adjust "AM Level" control (R49) for .30 volt of audio output at tape-outputs.	

FM ALIGNMENT

STEP	TUNER DIAL SETTING	SIGNAL GENERATOR			INDICATOR	ADJUST	TEST LIMITS	REMARKS
		FREQ.	COUPLING	MODULATION				
1	Point of no interference or signal	10.7MHz	TO TP-3	FM +200kHz at 60Hz rate	Osciloscope	TP #1	Top (secondary) and bottom (primary) cores of T1, T2, T3, T4 about 10.7 MHz and 10.7MHz + 75kHz	If sweep generator has no built-in markers, use external marker generator by mixing with swept IF signal at TP#3. First adjust Pri. and Sec. tuning slugs of T2, 3, 4, 5 for maximum amplitude. Note this amplitude on the scope. Then, readjust T3 and T4 (T2 and T5 if necessary) for 220kHz bandwidth and optimum symmetry, taking care that amplitude of scope pattern shall not decrease by more than 30%. Hold input

1								
2	Same	10.7MHz	Same	CW	VTVVM	Pin 6 of T6	T6 primary (bottom core)	Maximum possible negative voltage markars.
3	Same	Same	Same	Same	TP #2	T6 secondary (top core)	Adj. for 0 volts	
4	105MHz	105MHz	300 ohm antenna terminals w/*matching network	400 cycles 75kHz devia- tion	VTVVM connected to TP #1 and scope connected to L or R audio output	Oscillator trimmer (C14)	Maximum negative voltage	As the tuner output increases, attenuate genera- tor output to keep TP #1 voltage at a low level.
5	90MHz	90MHz	Same	Same	Same	Oscillator Coil (L5)	Same	Repeat steps 4 and 5 until dial calibration is accurate.
6	105MHz	105MHz	Same	Same	Same	Mixer trim- mer, RF trimmer & antenna trimmer C11, C6, C2	Same	Repeat steps 6 and 7 until TP#1 voltage is as high as possible. Connect a distortion analy- zer to output jacks (either main or tape) and apply a 1mV input signal. Measure harmonic distortion and adjust T6 (primary) bottom slug for minimum distortion. (Should be less than 0.5%).
7	90MHz	90MHz	Same	Same	Same	Mixer, RF, and antenna coil tuning slugs L4, L2, L2	Same	Step 8 is an overall sensitivity check. Adjust muting control (R105) by reducing the signal input to 5 microvolts for a 2dB drop in audio output. Push in muting button (S302E) for this adjustment.
8	105MHz & 90MHz	105MHz & 90MHz	Same	VTVVM connected to TP #1 and scope connected to L or R audio output.	VTVVM connected to TP #1 and scope connected to L or R output.	Connect distortion ana- lyzer to L or R output and reduce signal at antenna for -30dB total distortion and noise. Input signal required is TIFM usable sensit- ivity of the tuner (2.5 microvolts).		

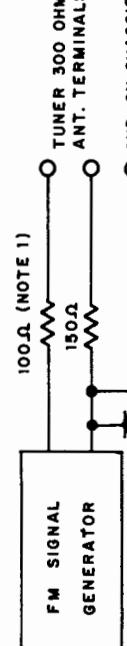
MULTIPLEX DECODER ALIGNMENT

STEP	TUNER DIAL SETTING	SIGNAL GENERATOR	INDICATOR	ADJUST	TEST LIMITS	REMARKS		
STEP	TUNER DIAL SETTING	FREQ.	COUPLING	MODULATION	TYPE	CONNECTED TO		
1	100MHz	100MHz	300Ω antenna approx. 1000 microvolts signal w/* matching network	75kHz Devia- tion @ 67kHz	AC-VTVVM	L or R output jack	L105 (SCA ADJ.)	Minimum output @ L or R output jack
2	100MHz	Same	19kHz pilot	AC-VTVVM or oscil- oscope W/very low cap. probe	T101, pin 2	L102 (19kHz phase adj.) & T101 (19 kHz doubler)	Adjust for maximum AC voltage	Decrease pilot level so that 19kHz circuits are not being saturated.

8	105MHz & 90MHz	105MHz & 90MHz	Same	VTVM connected to TP #1 and scope connected to L or R audio output.	Connect distortion analyzer to L or R output and reduce signal at antenna for -20dB total distortion and noise. Input signal required is IHFM usable sensitivity of the tuner (2.5 microvolts).	Step 8 is an overall sensitivity check. Adjust muting control (R105) by reducing the signal input to 5 microvolts for a 2dB drop in audio output. Push in muting button (S302E) for this adjustment.
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MULTIPLEX DECODER ALIGNMENT

STEP	TUNER DIAL SETTING	SIGNAL GENERATOR		INDICATOR	CONNECTED TO	ADJUST	TEST LIMITS	REMARKS
		FREQ.	COUPLING					
1	100MHz	100MHz	300Ω antenna terminals W/ approx. 1000 microvolts signal w/* matching network	AC-VTVM	L or R output jack	L105 (SCA ADJ.)	Minimum output @ L or R output jack	L105 (SCA adj.) is adjusted for minimum output with 67kHz modulation.
	100MHz	100MHz	Same	19kHz pilot	AC-VTVM or oscil-loscope W/very low cap. probe	T101, pin 2 or 3.	L102 (19kHz phase adj.) & T101 (19kHz doubler)	Adjust for maximum AC voltage
2	Same	Same	Same	Same	T102, Pin 1 or 2.	T102 (Pri) & bottom (Sec) maximum AC tuning slugs	Adjust for maximum AC voltage	Decrease pilot level so that 19kHz circuits are not being saturated.
	Same	Same	Same	Same	L or R output jack	T102, Bottom (Sec.) tuning slug.	30dB separation or more	Decrease pilot level so that 19kHz and 38kHz circuits are not being saturated. Mode switch must be in stereo position.
4	Same	Same	1kHz (100% modulation) L or R only, pilot on	Same	L or R output jack	T102, Bottom (Sec.) tuning slug.	30dB separation or more	First, modulate left channel and measure right channel output. Adjust T102 bottom - tuning slug (Sec.) for minimum right channel output. (maximum separation) Then, reverse channels and measure left channel separation. For this adjustment and measurement, no test lead should be connected to TP#2, and the dust cover over this section should be in place.
	100MHz	100MHz	1kHz (100% modulation) L or R only, pilot on	AC-VTVM	L or R output jack			Adjust "FM-Level" control (R107) for 1 volt of audio output at tape-outputs. Then, turn off the modulation and measure the residual of the 10kHz and 38kHz frequencies.
5								



* ANTENNA
MATCHING
NETWORK

Note 1 : If signal generator has other than 50 ohm internal impedance, use a resistor of 150 ohms less internal generator impedance.

REPLACEMENT PARTS

All parts not listed are common items obtainable from radio parts jobbers.

Replacement parts may be obtained when ordered by PART NUMBER from:

McIntosh Laboratory Inc.
Customer Service Department
2 Chambers Street
Binghamton, New York 13903
(telephone 607-723-3512)

CAPACITORS

Symbol Number		Description	Part Number
C56	Mylar	.22 μ F 250V	064-068
C58,59	Elect.	100 μ F 15V	066-127
C101	Mylar	.22 μ F 250V	064-068
C107	Elect.	100 μ F 15V	066-127
C111	Mylar	.1 μ F 250V	064-067
C113	Mylar	.22 μ F 250V	064-068
C127	Elect.	100 μ F 15V	066-127
C201	Elect.	100 μ F 25V	066-124
C202	Mylar	.22 μ F 250V	064-068
C204	Elect.	200/200 μ F 100V	066-129
C205,206	Mylar	.22 μ F 250V	064-068
C207	Mylar	.47 μ F 250V	064-069
C208,209	Elect.	100 μ F 15V	066-127
C210	Elect.	50/200/300/150 μ F 200/150/50/50V	066-218
C301,302	Mylar	.47 μ F 250V	064-069
C305,306	Elect.	10 μ F 20V	066-149
C307,308	Elect.	10 μ F 20V	066-149
C315,316	Elect.	100 μ F 15V	066-127
C317,318	Mylar	.47 μ F 250V	064-069
C319,320	Mylar	.22 μ F 200V	064-087
C323,324	Mylar	.047 μ F 250V	064-066
C325,326	Mylar	.47 μ F 250V	064-069
C327	Mylar	.47 μ F 250V	064-069
C329,330	Mylar	.047 μ F 250V	064-066
C331,332	Mylar	.022 μ F 250V	064-065
C337,338	Mylar	.1 μ F 250V	064-067
C339,340	Mylar	.47 μ F 250V	064-069
C341,342	Mylar	.047 μ F 250V	064-066
C343,344	Mylar	.47 μ F 250V	064-069
DIODES			
D1,2	Si. signal diode		070-022
D3,4	Si. signal diode		070-022

D5	Ge. signal diode	070-003
D6,7	Si. signal diode	070-022
D101,102	Si. signal diode	070-022
D103	Si. signal diode	070-022
D104	Ge. signal diode	070-003
D105,106	Ge. signal diode	070-003
D107	Ge. signal diode	070-003
D108	Bias diode	070-046
D201	Zener diode 16V	070-042
D202,203	Si. rectifier	070-031
D205,206	Si. rectifier	070-031
D207	Zener diode 75V	070-025
FUSE		
F201	Fuse .5 amp Slo-blo	089-020
CHOKES		
L1	Choke 1.2 μ H	122-011
L2	FM antenna coil	122-069
L3	FM RF coil	122-070
L4	FM mixer coil	122-071
L5	FM local oscillator coil	122-072
L6	AM loop antenna	122-074
L7	AM antenna coil	122-073
L10	Choke 75 μ H	122-013
L12	AM oscillator coil	122-066
L13	Choke 100mH	122-004
L14	Choke 1.2 μ H	122-011
L101	Choke 1mH	122-065
L102	Filter coil (19kHz phase)	122-067
L103,104	Filter coil (lo pass)	122-015
L105	Filter coil (SCA adjust)	122-068
TRANSISTORS		
Q1	Si. junction F.E.T.	132-049
Q2,3	Si. junction F.E.T.	132-049
Q4	M.O.S. F.E.T.	132-064
Q5,6	Si. NPN transistor	132-015
Q7	Si. junction F.E.T.	132-049
Q8	M.O.S. F.E.T.	132-064
Q9,10	M.O.S. F.E.T.	132-061
Q11	Si. NPN transistor	132-041
Q101	Si. NPN transistor	132-057
Q102	Si. NPN transistor	132-052
Q103	Si. NPN transistor	132-041

Q104,
Q106
Q201
Q202
Q203
Q301,
Q303,
Q305,
Q307,
Q309,
Q311,
Q313,
Q315,
R49
R105
R107
R335
R356
R377,
R219
R220
R221
S1
S202
S301
S302
S303
T1
T2
T3
T4
T5
T6
T7,8
T9
T10
T101

070-003	Q104,105	Si. NPN transistor	132-057
070-022	Q106	Si. NPN transistor	132-042
070-022	Q201	Si. NPN transistor	132-072
070-022	Q202	Si. NPN transistor	132-516
070-003	Q203	Si. NPN transistor	132-069
070-003	Q301,302	Si. PNP transistor	132-056
070-003	Q303,304	Si. PNP transistor	132-056
070-046	Q305,306	Si. NPN transistor	132-069
070-042	Q307,308	Si. NPN transistor	132-054
070-031	Q309,310	Si. PNP transistor	132-056
070-031	Q311,312	Si. NPN transistor	132-054
070-025	Q313,314	Si. NPN transistor	132-057
089-020	Q315,316	Si. NPN transistor	132-042
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	FRONT PANEL & TRIM	
	Front panel	043-0
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	Tuning knob	043-0
	Volume control knob	043-0
	Balance knob	043-0
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	Bass knob (rear)	090-0
	Bass knob (front)	043-0
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	Treble knob (front)	043-0
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	Hardware package	043-0
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	Dial glass	043-0
	Pointer	043-0
	Dial cord (complete)	043-0
	Fuseholder	178-0
	AC power cord	170-0
	Shipping carton	043-0
	Owners manual	038-0
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	Push terminal (antenna)	074-0

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	Tone control module	130-027
LAMPS		
	#1828 (MPX lamp)	058-027
	#1866 (front panel)	058-014
	Festoon lamp (dial glass)	058-032
FRONT PANEL & TRIM		
	Front panel	043-920
	Front panel end caps	018-120
	Tuning knob	043-272
	Volume control knob	043-253
	Balance knob	043-253
	Input selector knob	043-253
	Bass knob (rear)	090-009
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	Dial glass	043-897
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	Dial cord (complete)	043-891
	Fuseholder	178-001
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	Push terminal (antenna)	074-032

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15C0826S7-M0472

McIntosh SERVICE BULLETIN

AM NOISE REDUCTION MODIFICATION

MODEL: MX 112 FM/AM Tuner-Preamp

PURPOSE OF MODIFICATION: To improve AM signal to noise ratio.

WHAT UNITS ARE AFFECTED: Serial No. 10S01 to 43S90 Only.

WHEN MODIFICATION SHOULD BE MADE: When customer complains that AM is noisy on local stations or that sensitivity is poor.

McINTOSH MODIFICATION KIT NO.: No kit.

PARTS REQUIRED:

QUANTITY	PART NUMBER	DESCRIPTION
1	061-043	.01 μ F +80-20% Disc capacitor

PROCEDURE:

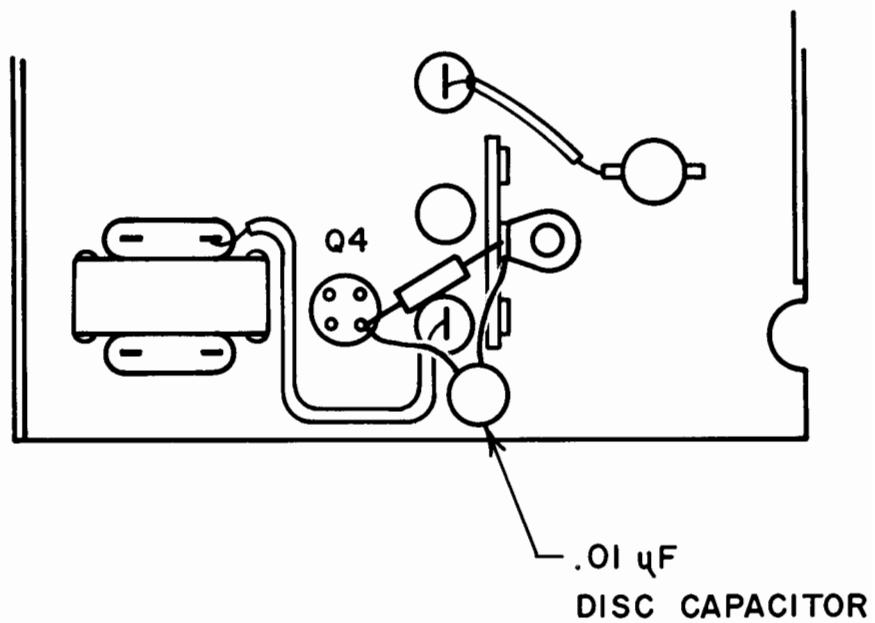
- Step 1 Remove bottom cover, Multiplex-AM top cover, and RF front end bottom cover. Remove capacitors C204 and C208 on AM PC board. See service manual for exact location. Replace top cover.
- Step 2 Locate Q4, AM RF amplifier in RF front end chassis. Connect the .01 μ F disc capacitor between the source terminal of Q4 and the ground lug of the terminal strip as shown in the accompanying sketch. Replace bottom covers.
- Step 3 Check performance. If dial calibration is off at high end of the band, perform AM alignment steps 3 and 5 in service manual. The top cover of the RF front end is removed for access to the alignment trimmers.

(over)

MX 112
S.B. No. 2

BOTTOM VIEW

RF CHASSIS



FRONT OF UNIT